Preliminary Measurements of RFA Prototype and Beam Measurements

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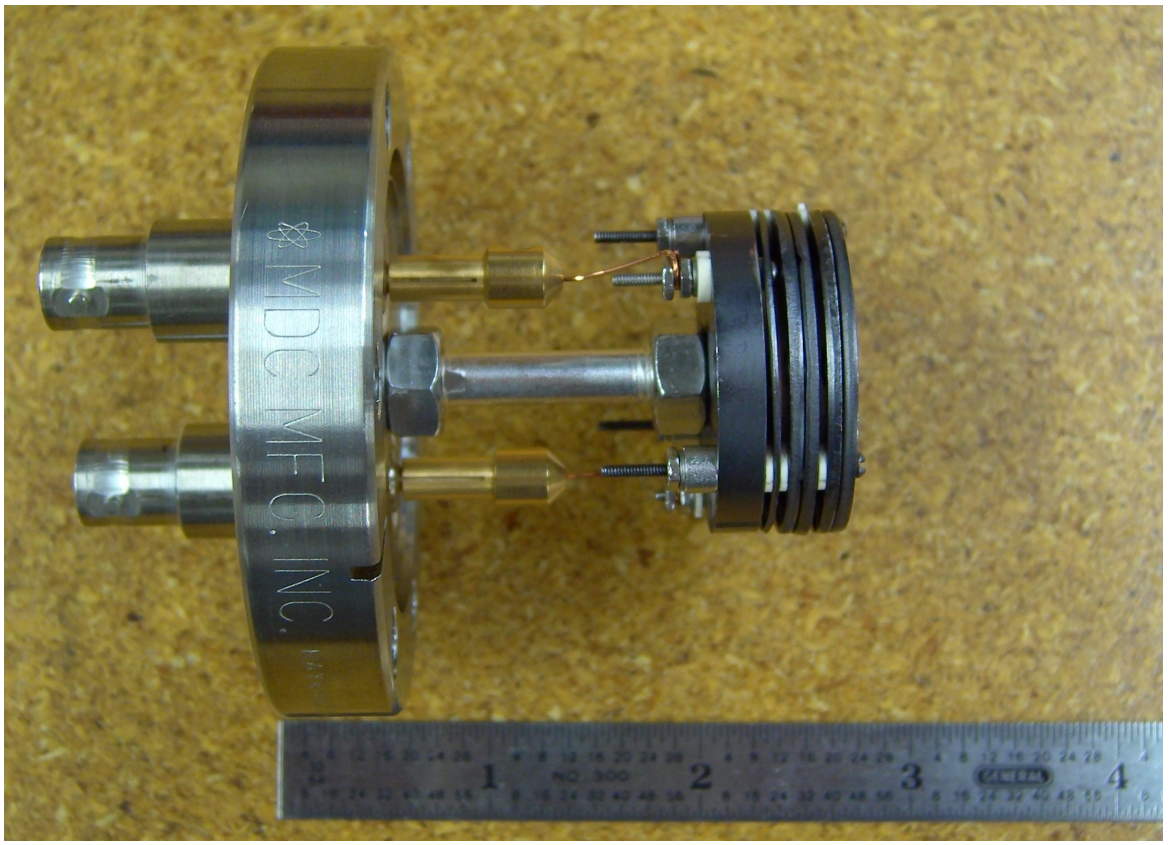
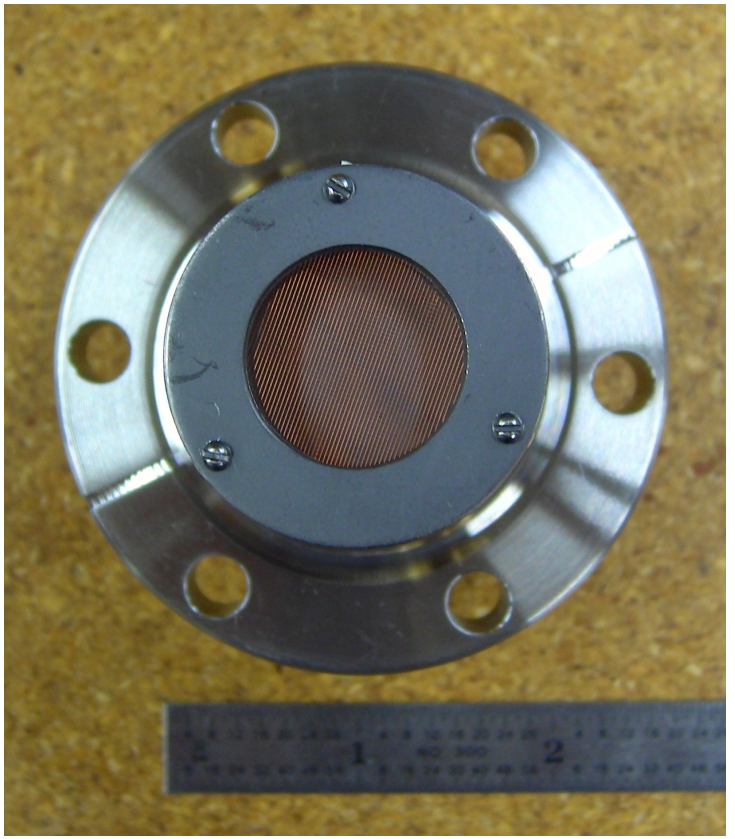
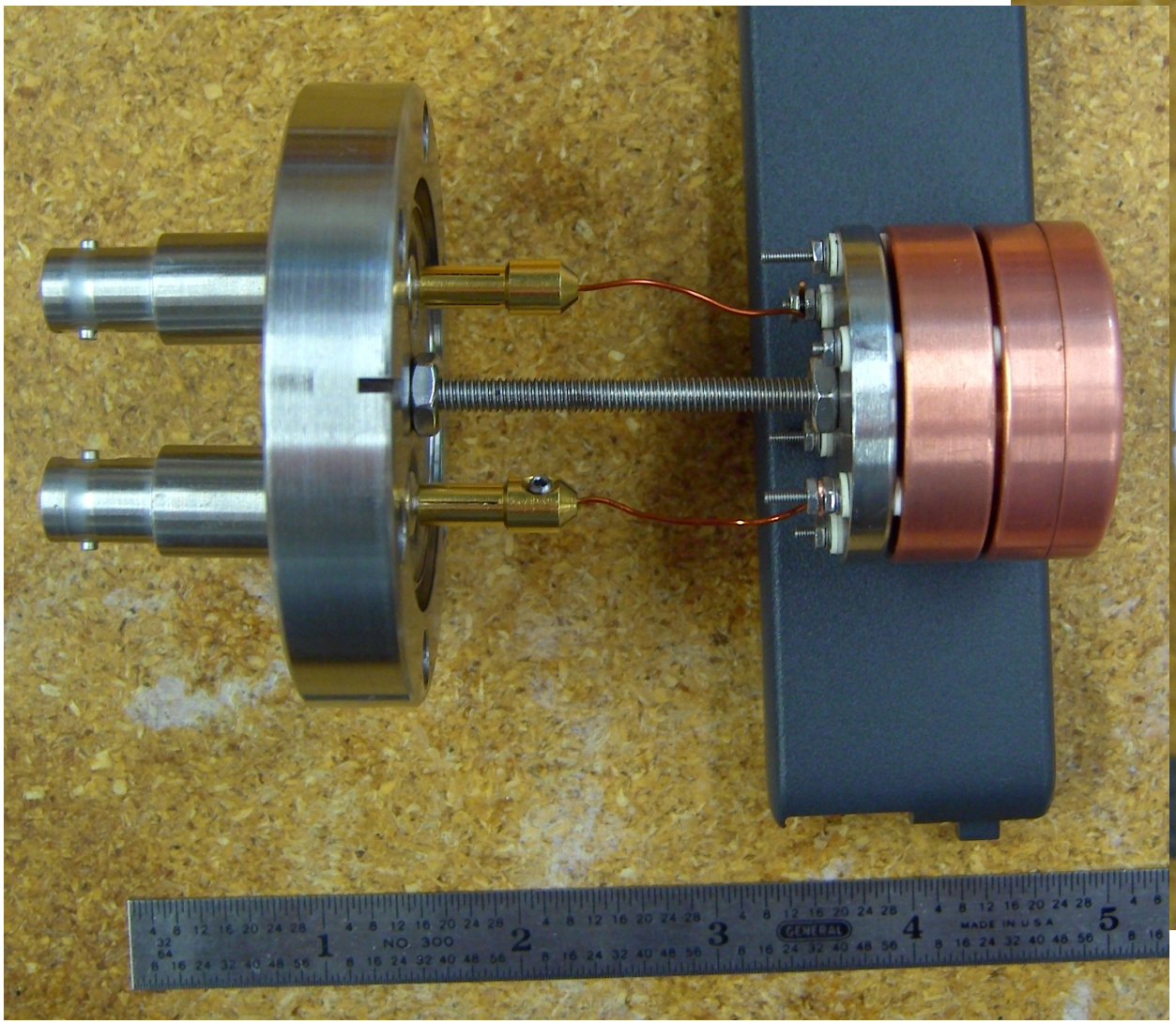
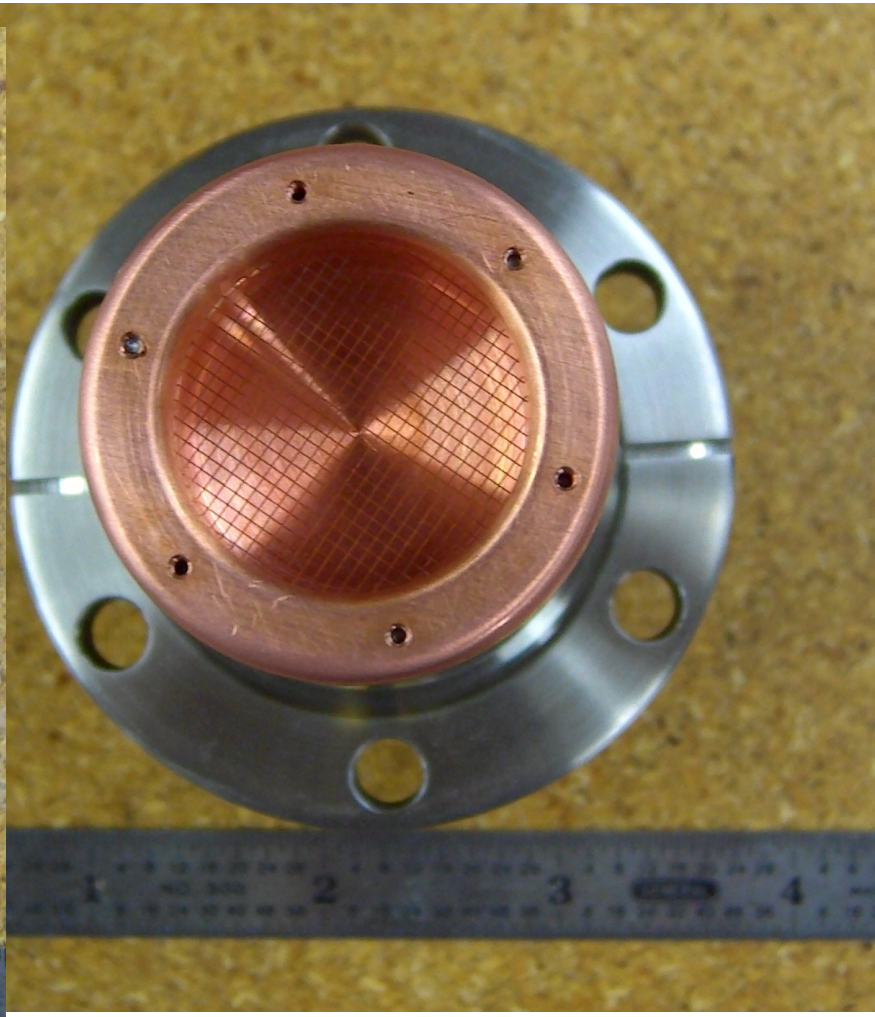
Argonne RFA



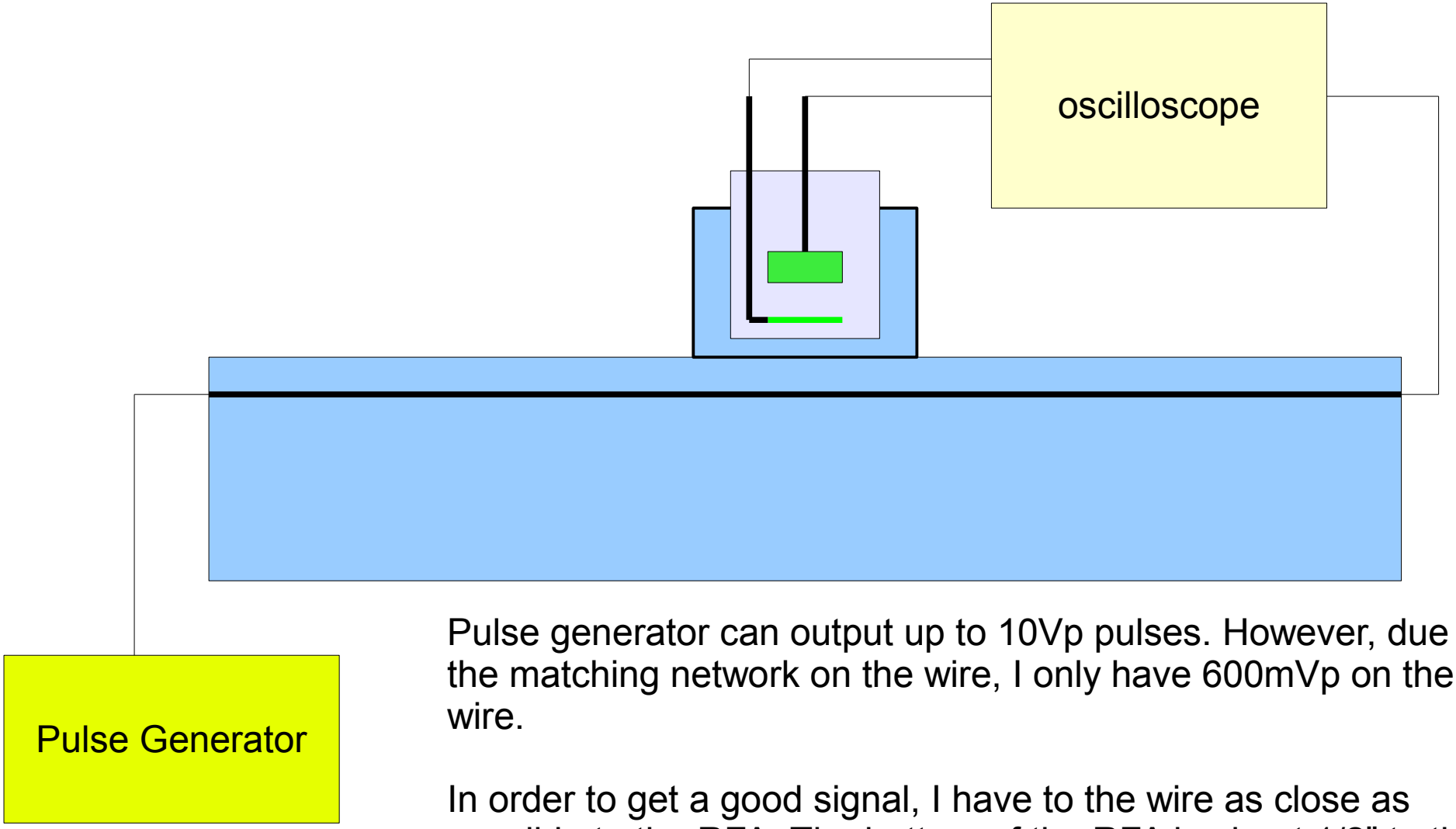


FNAL RFA





Setup



Pulse generator can output up to 10Vp pulses. However, due to the matching network on the wire, I only have 600mVp on the wire.

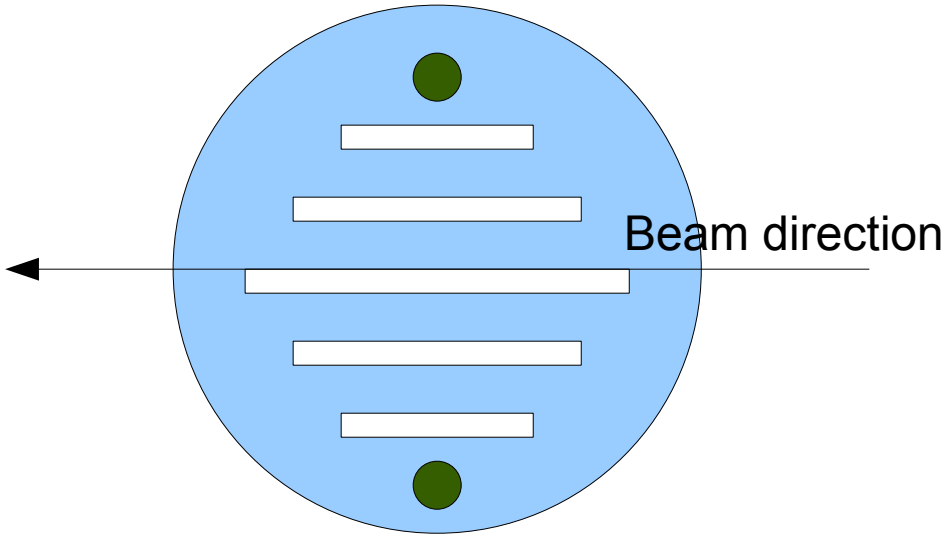
In order to get a good signal, I have to the wire as close as possible to the RFA. The bottom of the RFA is about 1/2” to the wire.

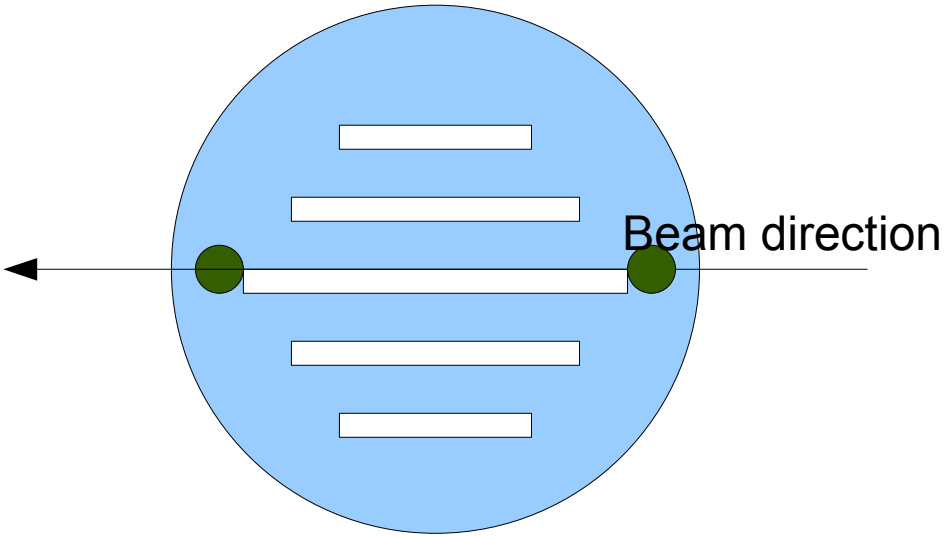
Important Discovery

The connecting wires are acting as antennas because I can change the size of the signal on the cathode by rotating it w.r.t. slot direction.

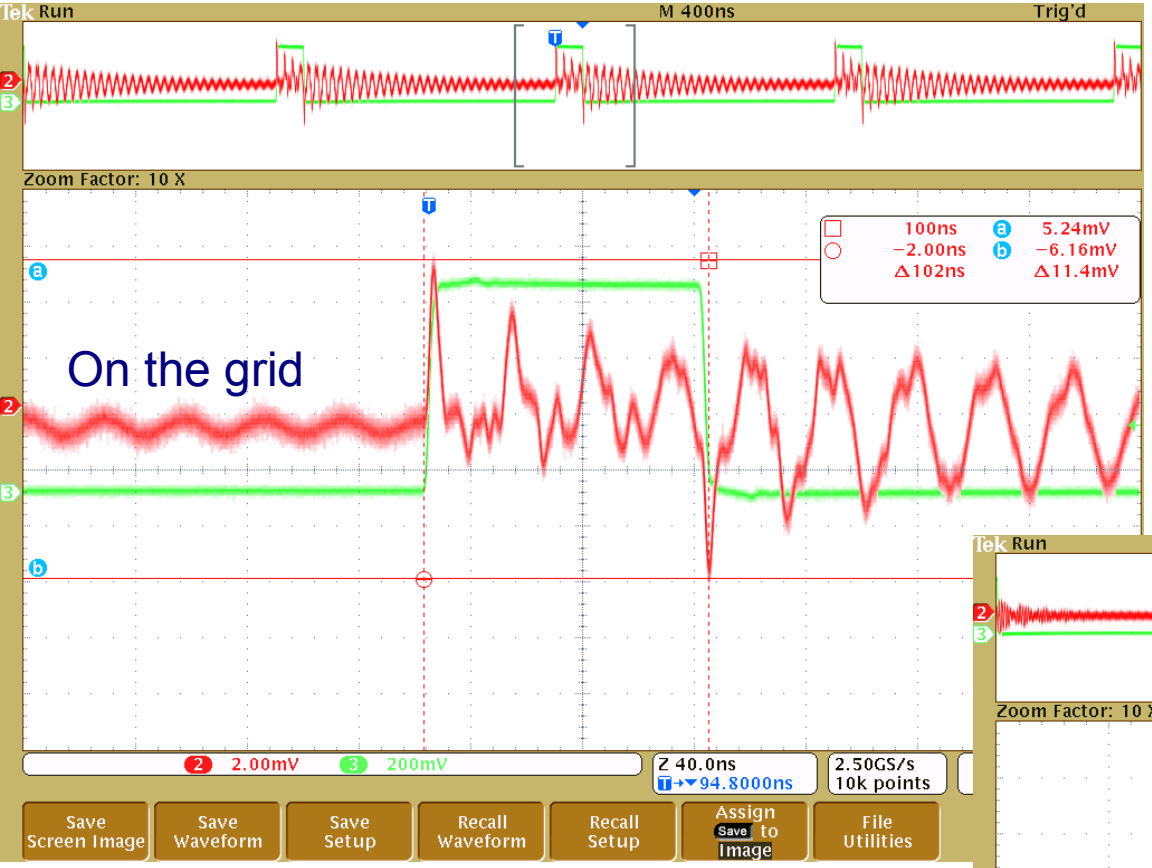
I need to look more carefully into this.

This is why a test bench setup was built!

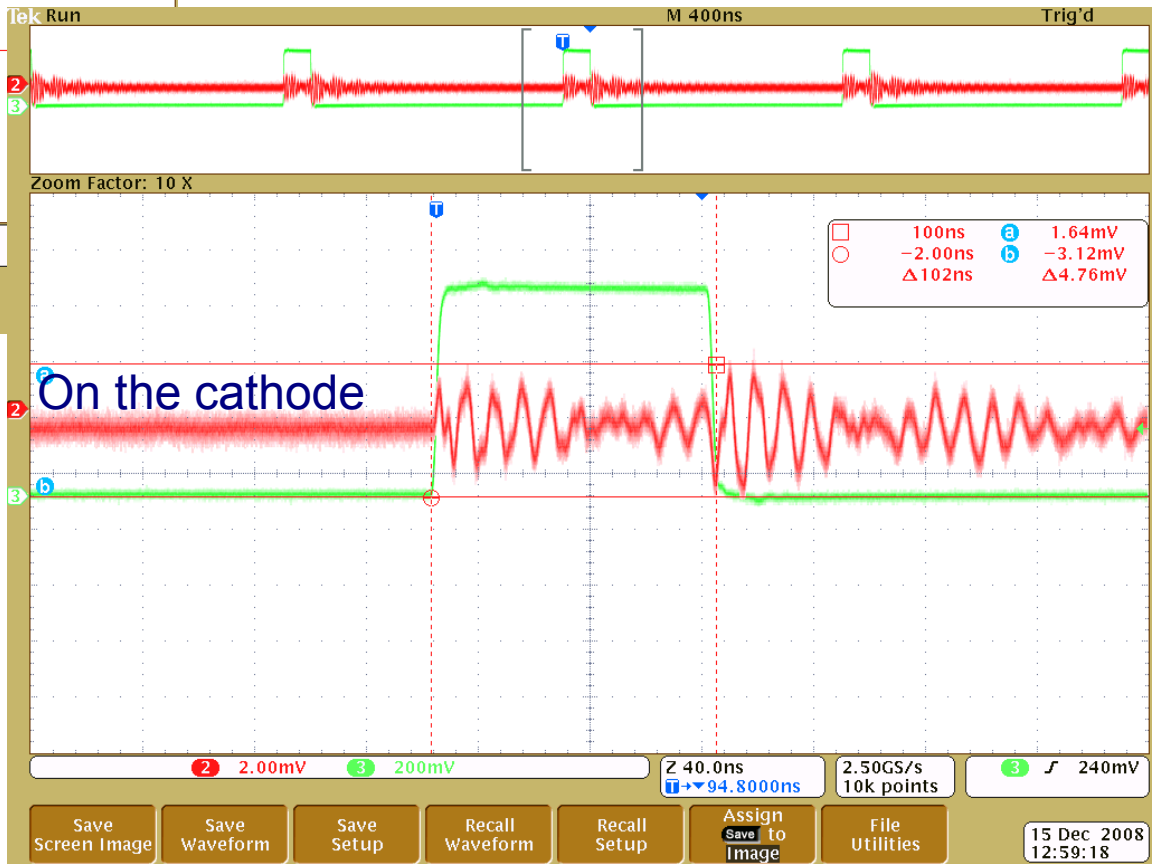




Without slots

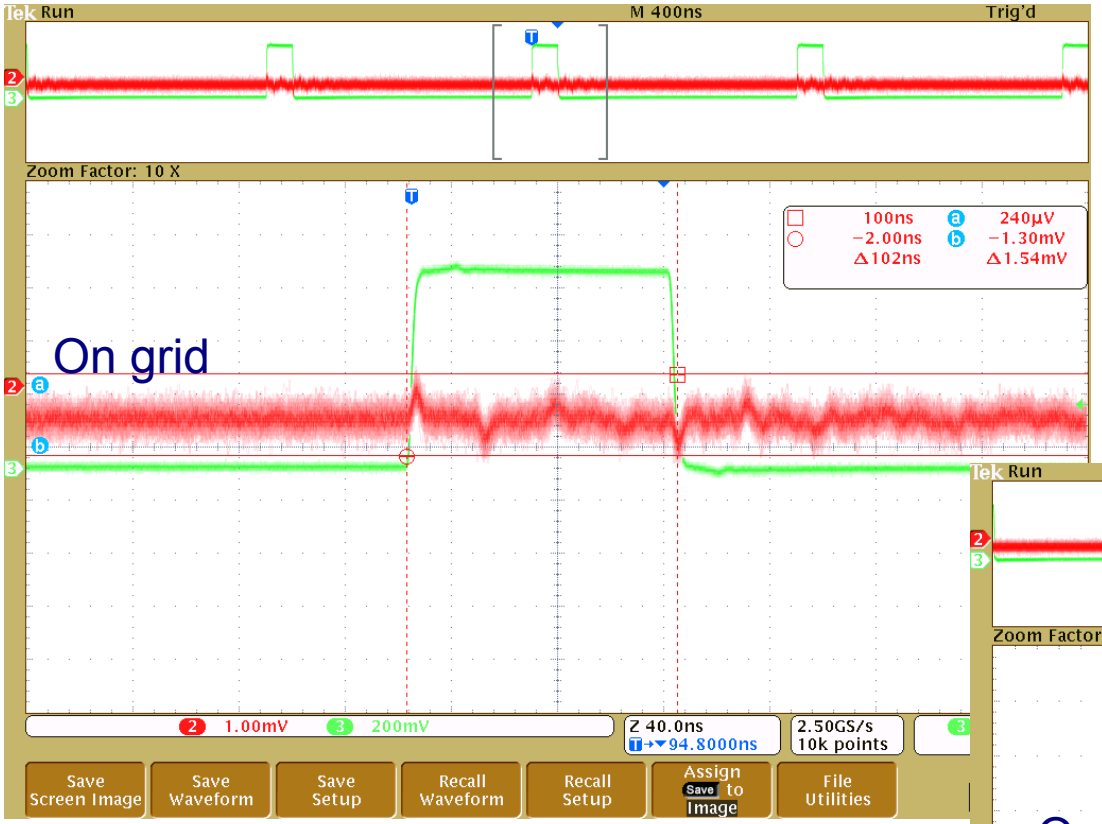


Note: clearly not matched to the input pulse which is 100ns in width. (green trace).

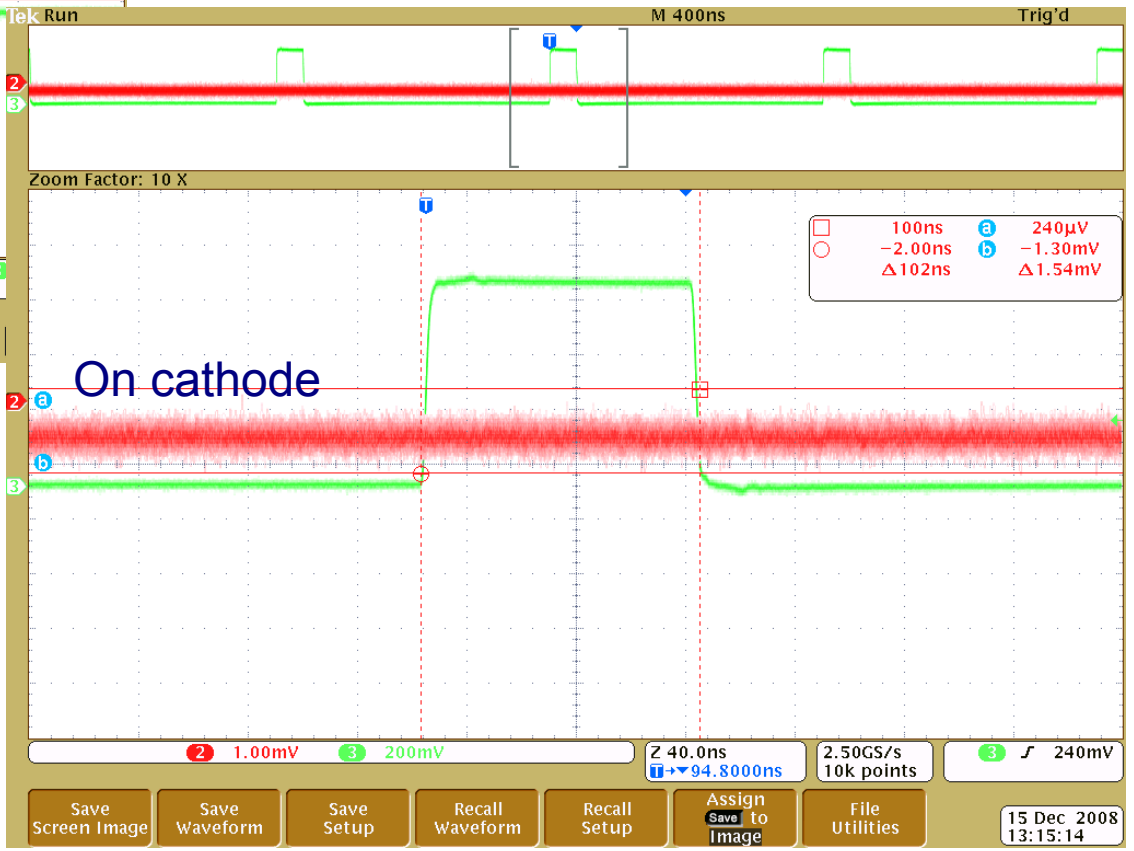


Attenuation Factor:
4.76/11.4 = 0.41 = -7.6 dB

Add Slots



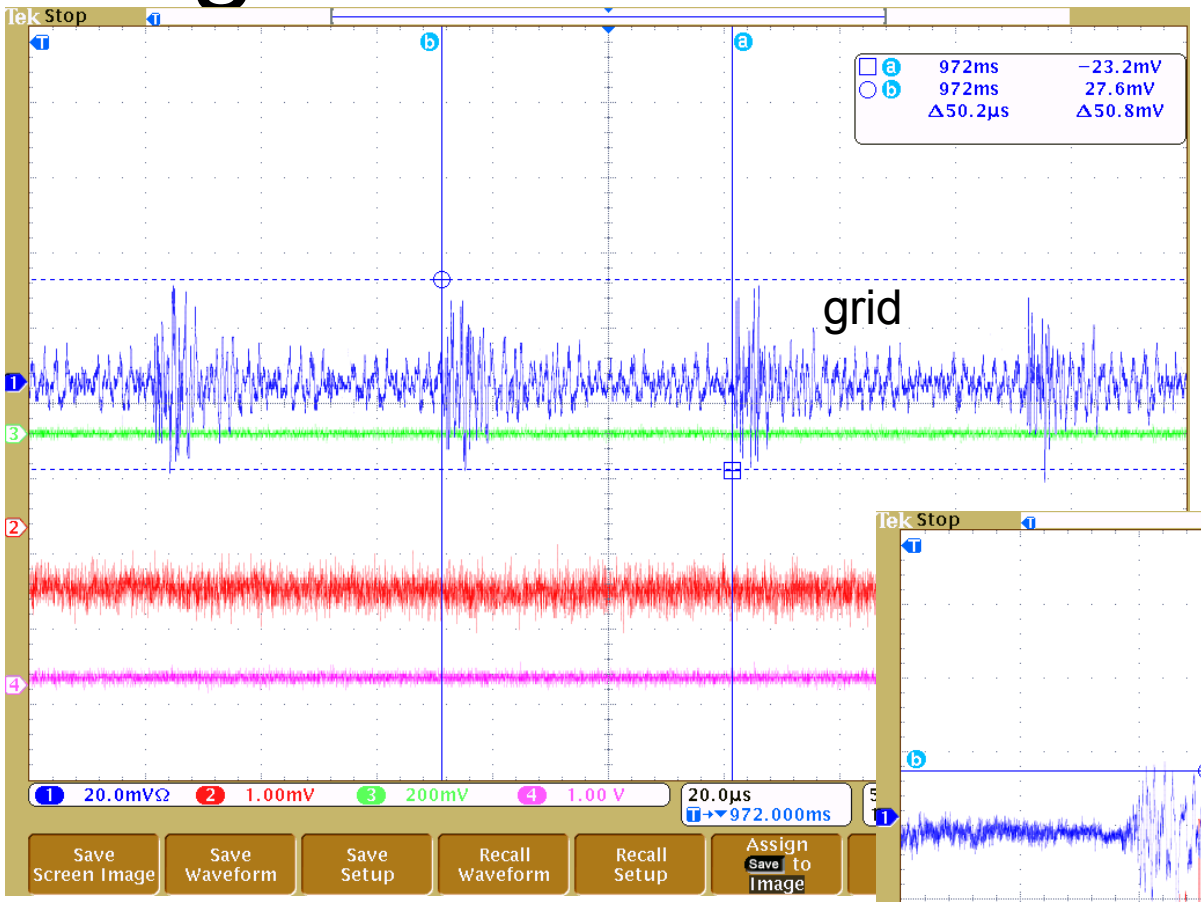
The addition of slots reduces the signal from the pulse quite a bit. In fact attenutation factor is:
1.54/11.4 = 0.13 = -17.4dB



I cannot see anything on the cathode. Using previous attenuation numbers, the pulse is attenuated by:
-(17.4 + 7.6) = -25dB

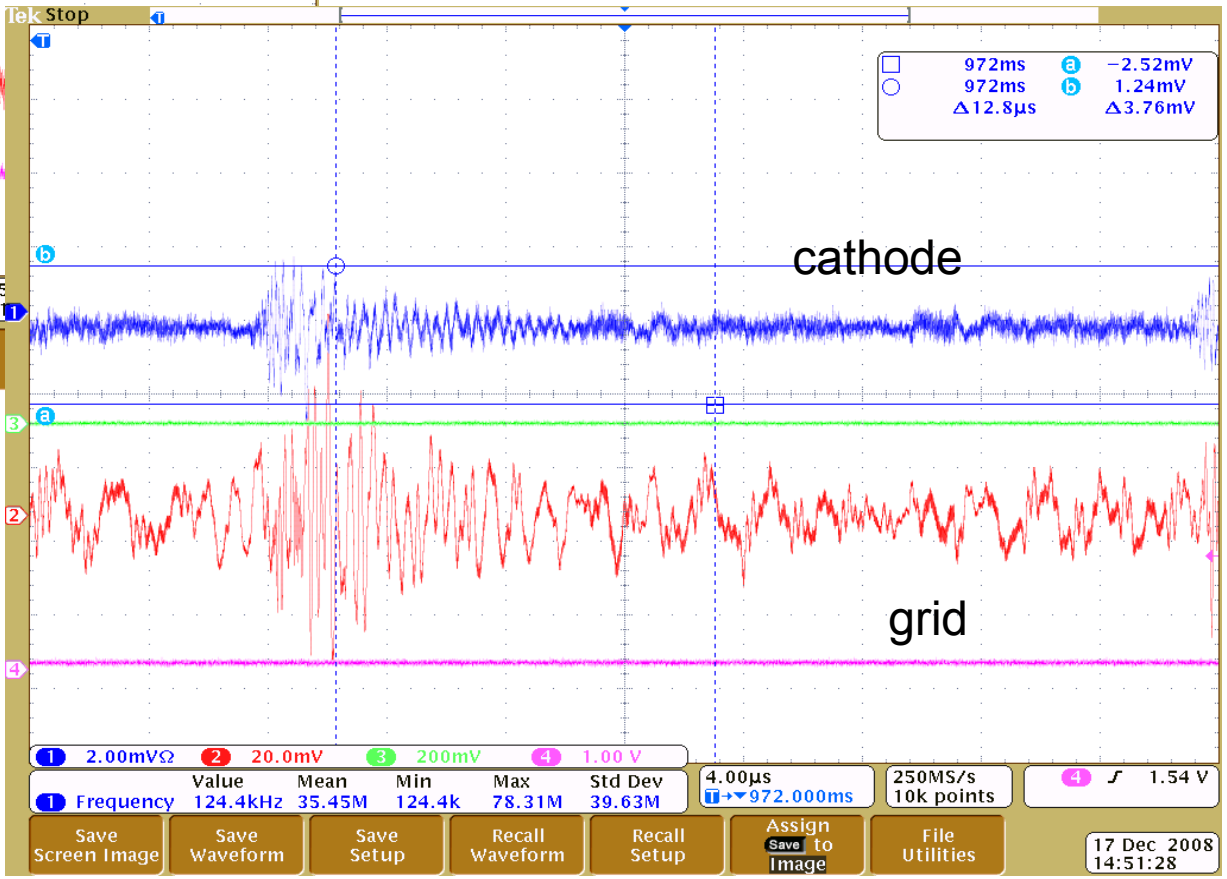
Real Beam

Signal on MI RFA. Looks like NOISE

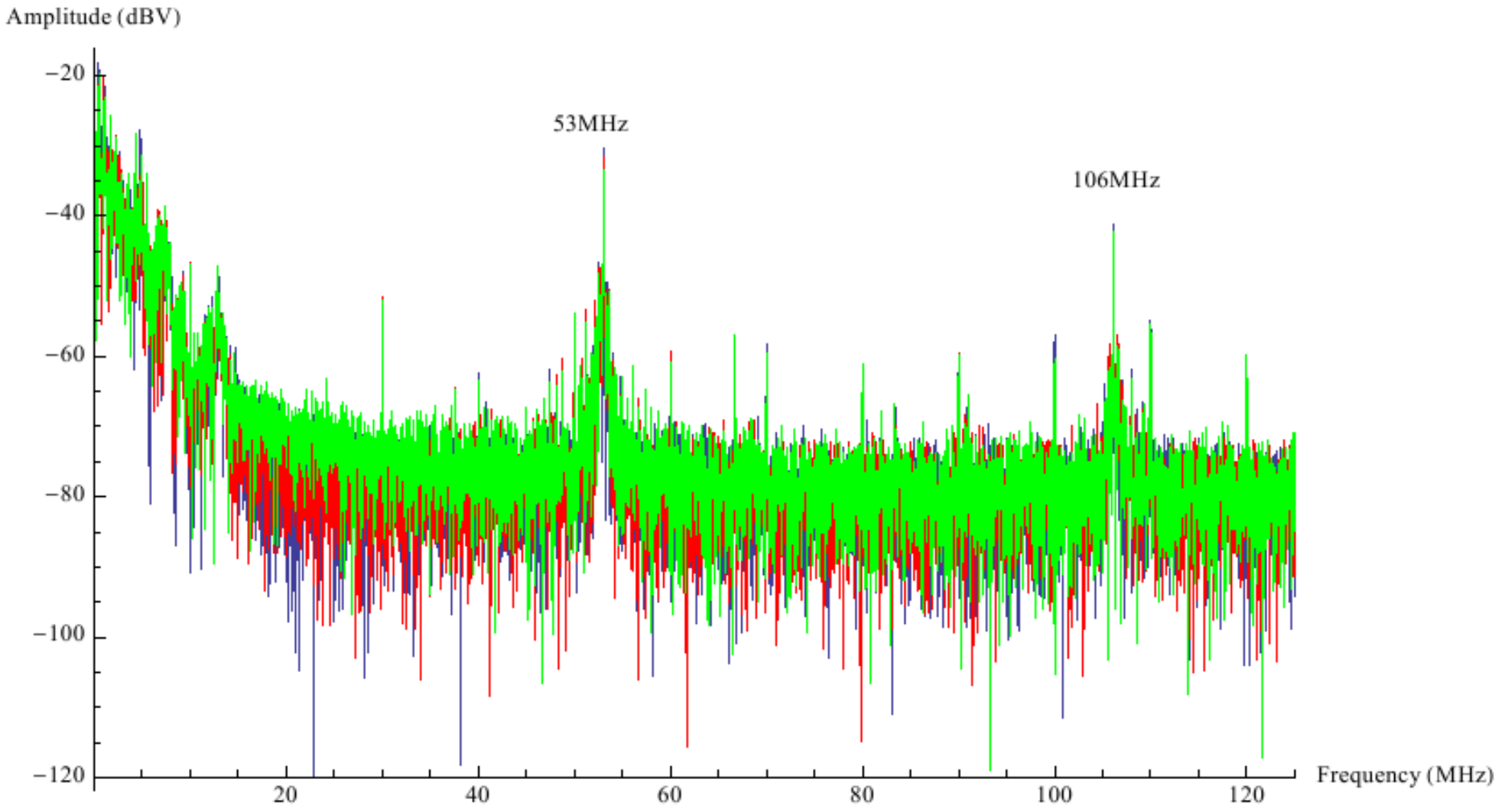


Attenuation factor between cathode and grid = 3.76/50.8 = 0.074 =-22dB.

Looks suspiciously to be on the grid rather than cables.

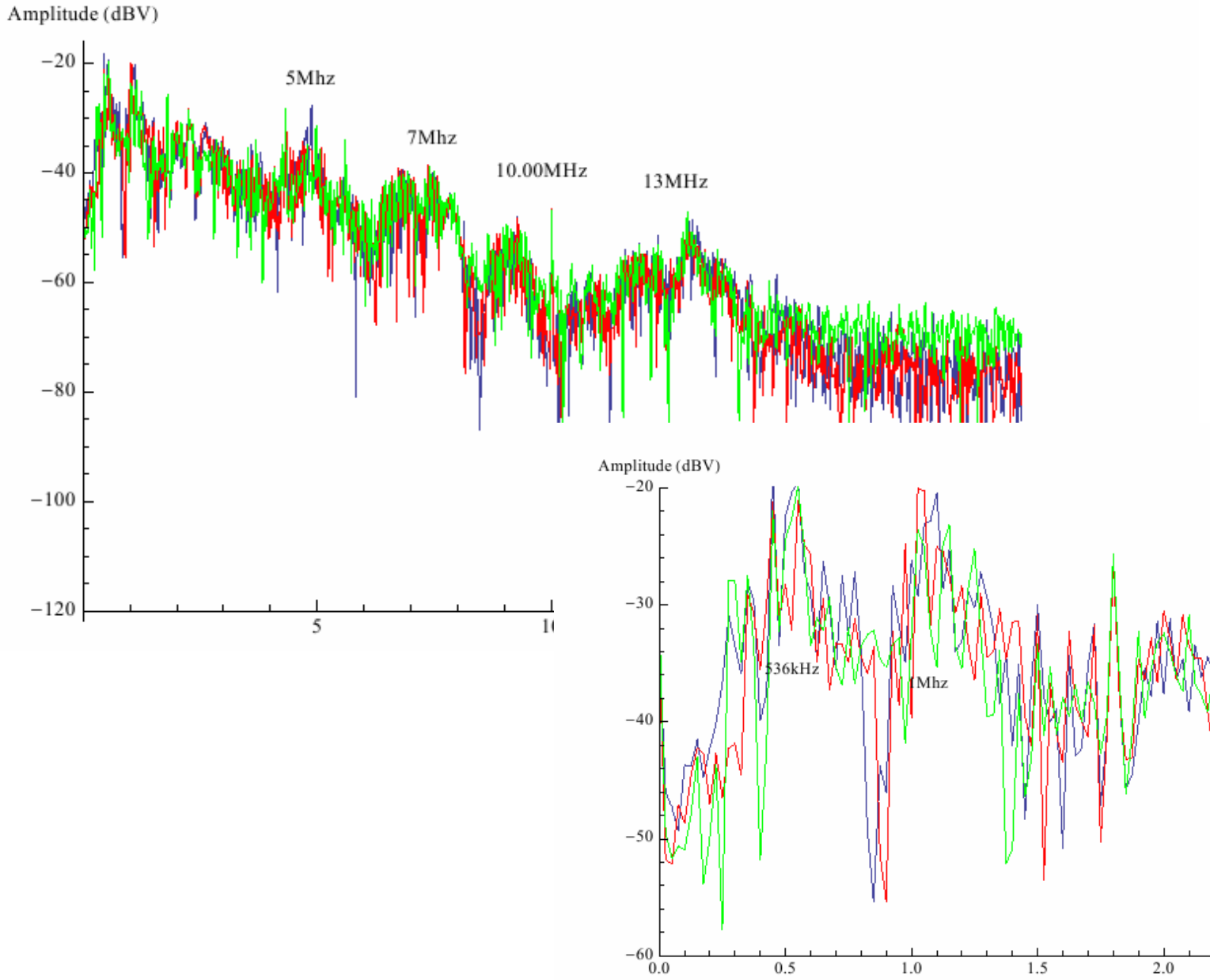


Fourier transforming the grid signal



More details in rfa.pdf

Zoomed in


Amplitude (dBV)
−20
−40
−60
−80
−100
−120
5Mhz
7Mhz
10.00MHz
13MHz
5
Amplitude (dBV)
−20
−30
−40
−50
−60
536kHz
1Mhz
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Frequency (MHz)

Conclusion

- I need to make a few more measurements on real beam: I want to see the 10kHz line.
- Measure with ANL RFA on test bench.
- Orientate the wires w.r.t. slots and try shielded cable.
- I think I know what is needed for the electronics.
  - We have the rad hard parts
  - I need $20 rad hard transistors.
  - Simulate and build!